OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from the **Ossipee Lake System (Lake Ossipee, Lower Danforth Pond, Broad Bay, Leavitt Bay, and Berry Bay)**, the program coordinators have made the following observations and recommendations.

Thank you for your continued hard work sampling the deep spots of these five waterbodies this year. As you know, conducting multiple sampling events each year enables DES to more accurately detect water quality changes. Keep up the good work!

FIGURE INTERPRETATION

- **Figure 1 and Table 1:** Figure 1 in Appendix A shows the historical and current year chlorophyll-a concentration in the water column. Table 1 in Appendix B lists the maximum, minimum, and mean concentration for each sampling year that the lake, pond, and bays have been monitored through VLAP.

  Chlorophyll-a, a pigment found in plants, is an indicator of the algal abundance. Because algae are usually microscopic plants that contain chlorophyll-a, and are naturally found in lake ecosystems, the chlorophyll-a concentration measured in the water gives an estimation of the algal concentration or lake productivity. **The median summer chlorophyll-a concentration for New Hampshire's lakes and ponds is 4.58 mg/m³.**

Ossipee System 2006 Chlorophyll-a Data

	2006 Annual Mean Result (mg/m³)	Comparison to NH Median	Comparison to Similar Lake Median
Lake Ossipee	2.04	Less than	Less than
Lower Danforth Pond	4.47	Slightly less than	Approx. equal to
Broad Bay	2.14	Much less than	Slightly less than
Leavitt Bay	2.26	Less than	Less than
Berry Bay	2.94	Less than	Less than

The mean annual chlorophyll-a concentration was ***highest*** at the **Lower Danforth Pond (4.47 mg/m³)** deep spot and ***lowest*** at the **Lake Ossipee (2.04 mg/m³)** deep spot. The mean chlorophyll concentration at the **Lake Ossipee, Leavitt Bay,** and **Berry Bay** deep spots was ***approximately equal.***

Ossipee System Historic Chlorophyll-a Data

	Sampling Period	Visual Analysis Trend
Lake Ossipee	2003 - 2006	Variable (ranging from 1.57 to 3.0 mg/m³)
Lower Danforth Pond	2003 - 2006	Variable (ranging from 2.68 to 4.53 mg/m³)
Broad Bay	1990 - 2006	Slightly Variable (ranging between approx. 1.23 – 3.46 mg/m³)
Leavitt Bay	1990 - 2006	Ranging from 1.07 to 3.24 mg/m³, but overall increasing (worsening)
Berry Bay	2003 - 2006	Slightly increasing (worsening), ranging from 2.35 to 2.94 mg/m³)

Overall, visual inspection of the historical data trend lines for **Lake Ossipee** and **Lower Danforth Pond** show a ***variable*** in-lake chlorophyll-a trend since monitoring began in **2003.** Visual inspection of the historical data trend line for **Berry Bay** shows a ***slightly increasing, meaning slightly worsening,*** in-lake chlorophyll-a trend since monitoring began in **2003**. After 10 consecutive years of sample collection, we will be able to conduct a statistical analysis of the historical data to objectively determine if there has been a significant change in the annual mean chlorophyll-a concentration since monitoring began at these three deep spots.

Visual inspection of the historical data show that the **Broad Bay** mean annual chlorophyll-a concentration has ***fluctuated slightly***, but has ***not continually increased or decreased,*** since monitoring began in **1990**.

Visual inspection of the historical data shows that the **Leavitt Bay** chlorophyll-a concentration has ***significantly increased, meaning worsened,*** since monitoring began in **1990.**
In the **2007** biennial annual report, since **Broad Bay** and **Leavitt Bay** will have been sampled for at least **ten** consecutive years for chlorophyll, we will conduct a statistical analysis of the historical data to objectively determine if there has been a significant change in

the annual mean chlorophyll-a concentration since monitoring began. Please refer to Appendix E for a detailed statistical analysis explanation.

While algae are naturally present in all lakes, an excessive or increasing amount of any type is not welcomed. In freshwater lakes, phosphorus is the nutrient that algae typically depend upon for growth in New Hampshire lakes. Algal concentrations may increase as nonpoint sources of phosphorus from the watershed increase, or as in-lake phosphorus sources increase. Therefore, it is extremely important for volunteer monitors to continually educate all watershed residents about management practices that can be implemented to minimize phosphorus loading to surface waters.

- **Figures 2a and 2b and Tables 3a and 3b:** Figure 2a in Appendix A shows the historical and current year data for transparency without the use of a viewscope and Figure 2b shows the current year data for transparency with the use of a viewscope. Table 3a in Appendix B lists the maximum, minimum and mean transparency data without the use of a viewscope and Table 3b lists the maximum, minimum and mean transparency data with the use of a viewscope for each year that the lake has been monitored through VLAP.

Volunteer monitors use the Secchi disk, a 20 cm disk with alternating black and white quadrants, to measure how far a person can see into the water. Transparency, a measure of water clarity, can be affected by the amount of algae and sediment in the water, as well as the natural color of the water. **The median summer transparency for New Hampshire's lakes and ponds is 3.2 meters.**

Ossipee System 2006 Non-Viewscope Transparency Data

	2006 Annual Mean	Comparison to NH Median	Comparison to Similar Lake Median
Lake Ossipee	2.71	Less than	Less than
Lower Danforth Pond	3.28	Slightly greater than	Less than
Broad Bay	2.88	Slightly less than	Much less than
Leavitt Bay	2.61	Less than	Much less than
Berry Bay	2.89	Slightly less than	Less than

The **2006** non-viewscope transparency annual means were the ***shallowest, meaning least deep,*** annual means for each of the five deep spots since monitoring began. It is likely that stormwater runoff laden with sediment and other organic debris, which flowed into the waterbodies during the significant spring and summer rain events, contributed to the decreased transparency.

The current year data (the top graph) show that the transparency at each deep spot was also measured with the viewscope on each sampling event. The transparency measured with the viewscope was generally ***greater than*** the transparency measured without the viewscope. As discussed previously, a comparison of the transparency readings taken with and without the use of a viewscope shows that the viewscope typically increases the depth to which the Secchi disk can be seen into the lake, particularly on sunny and windy days. We recommend that your group measure Secchi disk transparency with and without the viewscope on each sampling event.

It is important to note that viewscope transparency data is not compared to a New Hampshire median or similar lake median. This is because lake transparency has not been historically measured by DES with a viewscope. At some point in the future, the New Hampshire and similar lake medians for viewscope transparency will be calculated and added to the appropriate graphs.

Ossipee System Historic Transparency Data

	Sampling Period	**Visual Analysis Trend**
Lake Ossipee	2003 - 2006	Variable, but overall decreasing (worsening)
Lower Danforth Pond	2003 - 2006	Variable, but overall decreasing (worsening)
Broad Bay	1990 - 2006	Variable, but overall decreasing (worsening)
Leavitt Bay	1990 - 2006	Variable, but overall decreasing (worsening)
Berry Bay	2003 – 2006	Variable, but overall decreasing (worsening)

Visual inspection of the historical data trend line (the bottom graph) shows a ***variable, but overall decreasing, meaning worsening,*** trend for each of the five deep spots since monitoring began.

As previously discussed, after 10 consecutive years of sample collection at the **Lake Ossipee, Lower Danforth Pond,** and **Berry Bay** deep spots, we will be able to conduct a statistical analysis of the historical data to objectively determine if there has been a significant change in the annual mean transparency since monitoring began.

In the **2007** biennial annual report, since **Broad Bay** and **Leavitt Bay** will have been sampled for at least **ten** consecutive years for non-viewscope transparency, we will conduct a statistical analysis of the historical data to objectively determine if there has been a significant change in the annual mean transparency since monitoring began.

Please refer to Appendix E for a detailed statistical analysis explanation.

Typically, high intensity rainfall causes sediment-laden stormwater runoff to flow into surface waters, thus increasing turbidity and decreasing clarity. Efforts should continually be made to stabilize stream banks, lake shorelines, disturbed soils within the watershed, and especially dirt roads located immediately adjacent to the edge of tributaries and the lake. Guides to best management practices that can be implemented to reduce, and possibly even eliminate, nonpoint source pollutants, are available from DES upon request.

- **Figure 3 and Table 8:** The graphs in Figure 3 in Appendix A show the amount of epilimnetic (upper layer) phosphorus and hypolimnetic (lower layer) phosphorus; the inset graphs show current year data. Table 8 in Appendix B lists the annual maximum, minimum, and median concentration for each deep spot layer and each tributary since the lake has been sampled through VLAP.

  Phosphorus is typically the limiting nutrient for plant and algae growth in New Hampshire's lakes and ponds. Excessive phosphorus in a lake can lead to increased plant and algal growth over time. **The median summer total phosphorus concentration in the epilimnion (upper layer) of New Hampshire's lakes and ponds is 12 ug/L. The median summer phosphorus concentration in the hypolimnion (lower layer) is 14 ug/L.**

Ossipee System 2006 Deep Spot Epilimnetic Phosphorus Data

	2006 Epilimnetic Annual Mean (ug/L)	Comparison to NH Median	Comparison to Similar Lake Median
Lake Ossipee	9.3	Slightly less than	Slightly greater than
Lower Danforth Pond	12.3	Approximately equal to	Greater than
Broad Bay	9.8	Slightly less than	Slightly greater than
Leavitt Bay	8.3	Less than	Slightly greater than
Berry Bay	9.5	Slightly less than	Slightly greater than

The mean annual epilimnetic total phosphorus concentration was ***lowest*** at the **Leavitt Bay** deep spot **(8.3 ug/L)** and the ***highest*** at the **Lower Danforth Pond** deep spot **(12.3 ug/L).**

Ossipee System 2006 Deep Spot Hypolimnetic Phosphorus Data

	2006 Hypolimnetic Annual Mean (ug/L)	Comparison to NH Median	Comparison to Similar Lake Median
Lake Ossipee	8.3	Less than	Slightly greater than
Lower Danforth Pond	15.5	Approximately equal to	Slightly greater than
Broad Bay	7.7	Less than	Less than
Leavitt Bay	10	Less than	Less than
Berry Bay	10	Less than	Less than

The mean annual hypolimnetic phosphorus concentrations was the ***lowest*** at the **Lake Ossipee** deep spot **(8.3 ug/L)** and the ***highest*** at the **Lower Danforth Pond** deep spot **(15.5 ug/L).**

Ossipee System Historic Epilimnetic Phosphorus Data

	Sampling Period	Visual Analysis Trend
Lake Ossipee	2003 - 2006	Slightly increasing, meaning slightly worsening (ranging from 6 to 9.3 ug/L)
Lower Danforth Pond	2003 - 2006	Variable (ranging from 8 to 12.3 ug/L)
Broad Bay	1990 - 2006	Variable (ranging between approx 3 and 9.8 ug/L)
Leavitt Bay	1990 - 2006	Variable (Ranging between approx 3 and 12 ug/L)
Berry Bay	2003 - 2006	Slightly increasing, meaning slightly worsening (increasing from 9.5 to 9.5 ug/L)

Overall, visual inspection of the epilimnetic historic phosphorus data for **Lower Danforth Pond, Broad Bay,** and **Leavitt Bay** shows a ***variable*** trend, and for **Lake Ossipee** and **Berry Bay** shows a ***slightly worsening*** trend since monitoring began.

Ossipee System Historic Hypolimnetic Phosphorus Data

	Sampling Period	Visual Analysis Trend
Lake Ossipee	2003 - 2006	Relatively stable (ranging from 7 to 9 ug/L)
Lower Danforth Pond	2003 - 2006	Variable (ranging from 11 to 24.3 ug/L)
Broad Bay	1990 - 2006	Variable (ranging from 4.0 to 11.0 ug/L)
Leavitt Bay	1990 - 2006	Variable (ranging from 4.0 to 14.0 ug/L)
Berry Bay	2003 - 2006	Relatively stable (ranging from 7 to 10 ug/L)

Overall, visual inspection of the hypolimnetic historic phosphorus data shows a ***variable*** trend for **Lower Danforth Pond, Broad Bay, and Leavitt Bay,** and a ***relatively stable*** trend for **Lake Ossipee** and **Berry Bay** since monitoring began.

As previously discussed, after 10 consecutive years of sample collection at the **Lake Ossipee, Lower Danforth Pond,** and **Berry Bay** deep spots, we will be able to conduct a statistical analysis of the historical data to objectively determine if there has been a significant change in the annual mean epilimnetic and hypolimnetic phosphorus concentration since monitoring began.

In the **2007** biennial annual report, since **Broad Bay** and **Leavitt Bay** will have been sampled for at least **ten** consecutive years for phosphorus, we will conduct a statistical analysis of the historical data to objectively determine if there has been a significant change in the annual mean epilimnetic and hypolimnetic phosphorus since monitoring began. Please refer to Appendix E for a detailed statistical analysis explanation.

One of the most important approaches to reducing phosphorus loading to a waterbody is to continually educate watershed residents about the sources of phosphorus in a watershed and how excessive phosphorus loading can negatively affect the ecology and the recreational, economical, and ecological value of lakes and ponds.

TABLE INTERPRETATION

- **Table 2: Phytoplankton**
  Table 2 in Appendix B lists the current and historical phytoplankton species observed in the lake. Specifically, this table lists the three most dominant phytoplankton species observed in the sample and their relative abundance in the sample.

Ossipee System 2006 Phytoplankton Dominant Species

	6/22/06 Dominant Phytoplankton Species	**7/18/2006 Dominant Phytoplankton Species**
Lake Ossipee	*Dinobryon* (golden-brown) *Rhizosolenia* (diatom) *Asterionella* (diatom) *Chrysosphaerella* (golden-brown)	*Chrysosphaerella* (golden-brown) *Asterionella* (diatom) *Dinobryon* (golden-brown)
Lower Danforth Pond	*Uroglenopsis* (golden-brown) *Dinobryon* (golden-brown) *Synura* (golden-brown)	*Dinobryon* (golden-brown) *Synura* (golden-brown) *Ceratium* (dinoflagellate)
Broad Bay	*Dinobryon* (golden-brown) *Rhizosolenia* (diatom) *Chrysosphaerella* (golden-brown)	*Dinobryon* (golden-brown) *Anabaena* (cyanobacteria) *Rhizosolenia* (diatom)
Leavitt Bay	*Dinobryon* (golden-brown) *Uroglenopsis* (golden-brown) *Rhizosolenia* (diatom)	*Dinobryon* (golden-brown) *Rhizosolenia* (diatom) *Anabaena* (cyanobacteria)
Berry Bay	*Dinobryon* (golden-brown) *Rhizosolenia* (diatom) *Chrysosphaerella* (golden-brown)	*Dinobryon* (golden-brown) *Rhizosolenia* (diatom) *Merismopedia* (cyanobacteria)

Phytoplankton populations undergo a natural succession during the growing year. Please refer to the "Biological Monitoring Parameters" section of this report for a more detailed explanation regarding yearly plankton succession. Diatoms and golden-brown algae are typical in New Hampshire's less productive lakes and ponds.

- **Table 2: Cyanobacteria**
  The cyanobacterium ***Anabaena*** was one of the **most-dominant** species in the **Leavit Bay** 10.8% and **Broad Bay** 13.6% plankton samples on the **July 18** sampling event. ***This species, if present in large amounts, can be toxic to livestock, wildlife, pets, and humans.*** Please refer to the "Biological Monitoring Parameters" section of this report for a more detailed explanation regarding cyanobacteria.

  Cyanobacteria can reach nuisance levels when phosphorus loading from the watershed to surface waters is increased and favorable environmental conditions occur, such as a period of sunny, warm weather.

The presence of cyanobacteria serves as a reminder of the lake's delicate balance. Watershed residents should continue to act proactively to reduce nutrient loading to the lake by eliminating fertilizer use on lawns, keeping the lake shoreline natural, re-vegetating cleared areas within the watershed, and properly maintaining septic systems and roads.

In addition, residents should also observe the waterbodies in September and October during the time of fall turnover (lake mixing) to document any algal blooms that may occur. Cyanobacteria have the ability to regulate their depth in the water column by producing or releasing gas from vesicles. However, occasionally lake mixing can affect their buoyancy and cause them to rise to the surface and bloom. Wind and currents tend to "pile" cyanobacteria into scums that accumulate in one section of the waterbody. If a fall bloom occurs, please collect a sample in any clean jar or bottle and contact the VLAP Coordinator.

- **Table 4: pH**

Table 4 in Appendix B presents the in-lake and tributary current year and historical pH data.

pH is measured on a logarithmic scale of 0 (acidic) to 14 (basic). pH is important to the survival and reproduction of fish and other aquatic life. A pH below 6.0 typically limits the growth and reproduction of fish. A pH between 6.0 and 7.0 is ideal for fish. The median pH value for the epilimnion (upper layer) in New Hampshire's lakes and ponds is **6.6**, which indicates that the surface waters in the state are slightly acidic. For a more detailed explanation regarding pH, please refer to the "Chemical Monitoring Parameters" section of this report.

Ossipee System 2006 pH Data

	Mean Epilimnetic pH	**Mean Hypolimnetic pH**
Lake Ossipee	6.57	6.05
Lower Danforth Pond	6.63	6.18
Broad Bay	6.65	6.18
Leavitt Bay	6.57	6.29
Berry Bay	6.58	6.22

Overall, the mean pH among the five deep spots ranged from **6.05 (Lake Ossipee)** to **6.29 (Leavitt Bay)** in the hypolimnion and from **6.57 (Lake Ossipee)** to **6.63 (Lower Danforth Pond)** in the epilimnion, which means that the water is ***slightly acidic***.

It is important to point out that the pH in the hypolimnion (lower layer) was ***lower (more acidic)*** than in the epilimnion (upper layer) at each of the five deep spots. This increase in acidity near the lake bottom is likely due to the decomposition of organic matter and the release of acidic by-products into the water column.

Due to the presence of granite bedrock in the state and acid deposition received from snowmelt, rainfall, and atmospheric particulates, there is not much that can be feasibly done to effectively increase lake pH.

- **Table 5: Acid Neutralizing Capacity**
  Table 5 in Appendix B presents the current year and historical epilimnetic ANC for each year the lake has been monitored through VLAP.

  Buffering capacity (ANC) describes the ability of a solution to resist changes in pH by neutralizing the acidic input. The median ANC value for New Hampshire's lakes and ponds is **4.9 mg/L**, which indicates that many lakes and ponds in the state are at least "moderately vulnerable" to acidic inputs. For a more detailed explanation about ANC, please refer to the "Chemical Monitoring Parameters" section of this report.

  The Acid Neutralizing Capacity (ANC) in the epilimnion (the upper layer) at the five deep spots, ranged from **3.5 mg/L (Lake Ossipee) to 6.0 mg/L (Lower Danforth Pond)**, which is ***less than*** the state median and indicates that the surface water at each deep spot is ***moderately vulnerable*** to acidic inputs.

- **Table 6: Conductivity**
  Table 6 in Appendix B presents the current and historical conductivity values for tributaries and in-lake data. Conductivity is the numerical expression of the ability of water to carry an electric current, which is determined by the number of negatively charged ions from metals, salts, and minerals in the water column. The median conductivity value for New Hampshire's lakes and ponds is **40.0 uMhos/cm**. For a more detailed explanation, please refer to the "Chemical Monitoring Parameters" section of this report.

  The mean epilimnetic conductivity at the deep spots ranged from **38.19 uMhos/cm (Lake Ossipee)** to **42.40 uMhos/cm (Lower Danforth Pond)**, which is ***approximately equal to*** the state median.

Overall, the **2006** conductivity results for the five deep spots were ***lower than*** has been measured **during the past few years**. It is likely that the high water levels during **2006** diluted the ion concentration in surface waters throughout the watershed. Specifically, the unusually large amount of watershed runoff from the significant late spring rain events likely exceeded the amount of groundwater contribution to the tributaries and lake. In addition, any winter contribution of chloride to surface waters from road salt was likely flushed out of the tributaries and the lake before the lake stratified during the summer.

The epilimnetic conductivity has ***gradually increased*** at the **Broad Bay** and **Leavitt Bay** deep spots since monitoring began in **1990.** Typically, increasing conductivity indicates the influence of pollutant sources associated with human activities. These sources include failed or marginally functioning septic systems, agricultural runoff, and road runoff which contains road salt during the spring snow-melt. New development in the watershed can alter runoff patterns and expose new soil and bedrock areas, which could also contribute to increasing conductivity. In addition, natural sources, such as iron and manganese deposits in bedrock, can influence conductivity.

We recommend that your monitoring group conduct a shoreline conductivity survey of the lakes to help identify the sources of conductivity.

To learn how to conduct a shoreline or tributary conductivity survey, please refer to the 2004 special topic article, which is posted on the VLAP website at http://www.des.nh.gov/wmb/vlap/2004/documents/Appendix_D.pdf or contact the VLAP Coordinator.

- **Table 7a and Table 7b: Total Kjeldahl Nitrogen and Nitrite+Nitrate Nitrogen**
  Table 7a in Appendix B presents the current year and historical Total Kjeldahl Nitrogen and Table 7b presents the current year and historical nitrite and nitrate nitrogen. Nitrogen is another nutrient that is essential for the growth of plants and algae. Nitrogen is typically the limiting nutrient in estuaries and coastal ecosystems. However, in freshwater, nitrogen is not typically the limiting nutrient. Therefore, nitrogen is not typically sampled through VLAP. However, if phosphorus concentrations in freshwater are elevated, then nitrogen loading may stimulate additional plant and algal growth. Please refer to the “Chemical Monitoring Parameters” section of this report for a more detailed explanation.

During the most recent DES Lake Assessment Program survey of each of the five deep spots, the ratio of the epilimnetic total nitrogen concentration to total phosphorus (TN:TP) concentration in the ranged from **31 (Lake Ossipee)** to **60 (Lower Danforth Pond),** which is ***greater than*** **15** and suggests that each waterbody is **phosphorus-limited**. This means that any additional **phosphorus** loading to each of the five waterbodies will stimulate additional plant and algal growth. Therefore, it is not critical to conduct nitrogen sampling.

- **Table 8: Total Phosphorus**
  Table 8 in Appendix B presents the current year and historical total phosphorus data for in-lake and tributary stations. Phosphorus is the nutrient that limits the algae's ability to grow and reproduce. Please refer to the "Chemical Monitoring Parameters" section of this report for a more detailed explanation.

  Tributary sampling was not conducted through VLAP during the summer of 2003, 2004, 2005 or 2006. Consequently, we do not know the phosphorus concentration in the tributaries that flow into the ***Lake Ossipee System.***

  It would be best to sample the tributaries in the spring during snow-melt and during rainstorms to determine the quality of water that flows into each waterbody.

- **Table 9 and Table 10: Dissolved Oxygen and Temperature Data**
  Table 9 in Appendix B shows the dissolved oxygen/temperature profile(s) collected during **2006**. Table 10 in Appendix B shows the historical and current year dissolved oxygen concentration in the hypolimnion (lower layer). The presence of dissolved oxygen is vital to fish and amphibians in the water column and also to bottom-dwelling organisms. Please refer to the "Chemical Monitoring Parameters" section of this report for a more detailed explanation.

  On the **June 22** sampling event, the dissolved oxygen concentration in the bottom meter at each of the deep spots was ***relatively high,*** **ranging from 6.0 to 7.0 mg/L.**

  On the **July 18** sampling event, the dissolved oxygen concentration in the bottom meter at the deep spot of **Lake Ossipee** was ***relatively high*** **(7.0 mg/L).** However, the dissolved oxygen concentration in the bottom meter at the deep spot of **Lower Danforth Pond, Broad Bay,** and **Berry Bay** was ***at least slightly depleted*** **(0.1 mg/L, 0.1 mg/L, and 3.1 mg/L, respectively).** *Due to excessively windy* *conditions, a dissolved oxygen profile was not collected at the Leavitt Bay deep spot on the July 18 sampling event.*

As stratified lakes age, and as the summer progresses, oxygen typically becomes ***depleted*** in the hypolimnion by the process of decomposition. Specifically, the reduction of hypolimnetic oxygen is primarily a result of biological organisms using oxygen to break down organic matter, both in the water column and particularly at the bottom of the lake where the water meets the sediment. When hypolimnetic oxygen concentration is depleted to less than 1 mg/L, **as it was on the July 18 biologist visit at the Lower Danforth Pond and Broad Bay deep spots,** the phosphorus that is normally bound up in the sediment may be re-released into the water column, a process referred to as ***internal phosphorus loading***.

- **Table 11: Turbidity**

Table 11 in Appendix B lists the current year and historical data for in-lake and tributary turbidity. Turbidity in the water is caused by suspended matter, such as clay, silt, and algae. Water clarity is strongly influenced by turbidity. Please refer to the “Other Monitoring Parameters” section of this report for a more detailed explanation.

The turbidity of the **Lake Ossipee** deep spot epilimnetic sample was ***elevated*** (**10.90 NTUs**) on the **July 18** sampling event. This suggests that a rainstorm may have recently contributed sediment-laden stormwater runoff to the lake and/or an algal bloom had occurred in the lake.

The turbidity of the **Lower Danforth Pond** deep spot hypolimnetic hypolimnion sample was ***elevated*** on the **July 18** sampling event (**5.41 NTUs**). This suggests that the pond bottom may have been disturbed by the anchor or by the Kemmerer Bottle while sampling and/or that the pond bottom is covered by a thick organic layer of sediment which is easily disturbed. When the pond bottom is disturbed, sediment, which typically contains attached phosphorus, is released into the water column. When collecting the hypolimnion sample, make sure that there is no sediment in the Kemmerer Bottle before filling the sample bottles.

- **Table 12: Bacteria (*E.coli*)**
  Table 12 in Appendix B lists the current year and historical data for bacteria *(E.coli*) testing. *E. coli* is a normal bacterium found in the large intestine of humans and other warm-blooded animals. *E.coli* is used as an indicator organism because it is easily cultured and its presence in the water, in defined amounts, indicates that sewage **may** be present. If sewage is present in the water, potentially harmful disease-causing organisms **may** also be present.

  Bacteria sampling was **not** conducted during **2006**. If residents are concerned about sources of bacteria such as failing septic systems, animal waste, or waterfowl waste, it is best to conduct *E. coli* testing when the water table is high, when beach use is heavy, or immediately after rain events.

- **Table 13: Chloride**
  Table 13 in Appendix B lists the current year and the historical data for chloride sampling. The chloride ion (Cl^-) is found naturally in some surfacewaters and groundwaters and in high concentrations in seawater. Research has shown that elevated chloride levels can be toxic to freshwater aquatic life. In order to protect freshwater aquatic life in New Hampshire, the state has adopted **acute and chronic** chloride criteria of **860 and 230 mg/L** respectively. The chloride content in New Hampshire lakes is naturally low, generally less than 2 mg/L in surface waters located in remote areas away from habitation. Higher values are generally associated with salted highways and, to a lesser extent, with septic inputs. Please refer to the "Chemical Monitoring Parameters" section of this report for a more detailed explanation.

  Chloride sampling was **not** conducted during **2006.**

- **Table 14: Current Year Biological and Chemical Raw Data**
  Table 14 in Appendix B lists the most current sampling year results. Since the maximum, minimum, and annual mean values for each parameter are not shown on this table, this table displays the current year "raw," meaning unprocessed, data. The results are sorted by station, depth, and then parameter.

- **Table 15: Station Table**
  As of the spring of 2004, all historical and current year VLAP data are included in the DES Environmental Monitoring Database (EMD). To facilitate the transfer of VLAP data into the EMD, a new station identification system had to be developed. While volunteer monitoring groups can still use the sampling station names that they have used in the past and are most familiar with, an EMD station name also exists for each VLAP sampling location. Table 15 in Appendix B identifies what EMD station name corresponds to the station names you have used in the past and will continue to use in the future.

DATA QUALITY ASSURANCE AND CONTROL

Annual Assessment Audit:

During the annual visit to each lake, the biologist trained your group how to collect samples at the deep spot and the outlet. Your group learned very quickly and did a great job following instructions.

In future years, the biologist will conduct a "Sampling Procedures Assessment Audit" of your monitoring group during the annual visit. Specifically, the biologist will observe the performance of your monitoring group while sampling and will document the ability of the volunteer monitors to follow the proper field sampling procedures (as outlined in the VLAP Monitor's Field Manual). This assessment is used to identify any aspects of sample collection in which volunteer monitors fail to follow proper procedures, and also provides an opportunity for the biologist to retrain the volunteer monitors as necessary. This will ultimately ensure that the samples that the volunteer monitors collect are truly representative of actual lake and tributary conditions.

Sample Receipt Checklist:

Each time your monitoring group dropped off samples at the laboratory this summer, the laboratory staff completed a sample receipt checklist to assess and document if your group followed proper sampling techniques when collecting the samples. The purpose of the sample receipt checklist is to minimize, and hopefully eliminate, future re-occurrences of improper sampling techniques.

Overall, the sample receipt checklist showed that your monitoring group did an ***excellent*** job when collecting samples and submitting them to the laboratory this year! Specifically, the members of your monitoring group followed the proper field sampling procedures and there was no need for the laboratory staff to contact your group with questions, and no samples were rejected for analysis.

USEFUL RESOURCES

Acid Deposition Impacting New Hampshire's Ecosystems, DES fact sheet ARD-32, (603) 271-2975 or www.des.nh.gov/factsheets/ard/ard-32.htm.

Best Management Practices to Control Nonpoint Source Pollution: A Guide for Citizens and Town Officials, DES Booklet WD-03-42, (603) 271-2975.

Best Management Practices for Well Drilling Operations, DES fact sheet WD-WSEB-21-4, (603) 271-2975 or www.des.nh.gov/factsheets/ws/ws-21-4.htm.

Biodegradable Soaps and Water Quality, DES fact sheet BB-54, (603) 271-2975 or www.des.nh.gov/factsheets/bb/bb-54.htm.

Canada Geese Facts and Management Options, DES fact sheet BB-53, (603) 271-2975 or www.des.nh.gov/factsheets/bb/bb-53.htm.

Cyanobacteria in New Hampshire Waters Potential Dangers of Blue-Green Algae Blooms, DES fact sheet WMB-10, (603) 271-2975 or www.des.nh.gov/factsheets/wmb/wmb-10.htm.

Erosion Control for Construction in the Protected Shoreland Buffer Zone, DES fact sheet WD-SP-1, (603) 271-2975 or www.des.nh.gov/factsheets/sp/sp-1.htm.

Freshwater Jellyfish In New Hampshire, DES fact sheet WD-BB-5, (603) 271-2975 or www.des.nh.gov/factsheets/bb/bb-51/htm.

Impacts of Development Upon Stormwater Runoff, DES fact sheet WD-WQE-7, (603) 271-2975 or www.des.nh.gov/factsheets/wqe/wqe-7.htm.

IPM: An Alternative to Pesticides, DES fact sheet WD-SP-3, (603) 271-2975 or www.des.nh.gov/factsheets/sp/sp-3.htm.

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